



Volume XIX Issue 2 - 2003

Cleared for Public Release - Distribution Unlimited

# SURVIAC

## Bulletin

### JOINT LIVE FIRE/AIRCRAFT SYSTEMS PROGRAM (JLF/AS)

The Joint Live Fire (JLF) Program was initiated by the Office of the Secretary of Defense (OSD) in March of 1984 to establish a formal process to test and evaluate fielded U.S. systems against realistic threats. The program continues today under the auspices of Mr. Larry Miller, Deputy Director, Operational Test and Evaluation/Live Fire Testing (DDOT&E/LFT). The JLF Program was chartered to assess the vulnerability of fielded U.S. armored vehicles and combat aircraft to threats likely to be encountered in combat and to evaluate the lethality of fielded U.S. munitions against realistic targets. The Joint Aircraft Survivability Program Office (JASPO) and the Joint Technical Coordinating Group for Munitions Effectiveness (JTTCG/ME) are the executive agents for the JLF Program, aircraft and ground/mobile systems, respectively, while the Services execute and support the tests under joint leadership. The JLF Program consists of three groups: Aircraft Systems (JLF/AS), Armor/Anti-Armor (JLF/A/AA), and Sea Systems (JLF/SS). JLF/AS focuses on the vulnerability of U.S. fixed-wing and rotary aircraft to realistic threats and on the lethality of fielded U.S. weapons/munitions against foreign aircraft. This article features JLF/AS projects receiving FY04 funding.



The DDOT&E/LFT intends to more closely integrate the JLF Program into other focus areas within DOT&E, such as integrated survivability assessments and increased understanding of vulnerabilities of legacy systems; and to leverage the program with other DOT&E investment programs (Threat Systems Office, JASPO, JTTCG/ME, Center for Countermeasures, and Live Fire Testing and Training Initiative). To that end, the DDOT&E/LFT has approved JLF/AS projects for FY04 that will provide empirical data on the vulnerabilities of some of our currently fielded aircraft platforms. These data will be made available to the test and evaluation community at large and to the system program managers. The FY04 JLF/AS Program consists of vulnerability tests and assessments on the following fielded rotorcraft and fixed-wing aircraft: the AH-1, CH-47D, CH-53E, H-60 and the Predator unmanned aerial vehicle (UAV). The vulnerability of a large turbofan engine to the MANPADS threat will also be initiated in FY04.

*JLF/AS Continued on page 4*

<http://iac.dtic.mil/surviac>

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>2003</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2003 to 00-00-2003</b>	
4. TITLE AND SUBTITLE <b>SURVIAC Bulletin: Joint Live Fire/Aircraft Systems Program (JLF/AS), Volume 19, Issue 2 - 2003</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>JAS Program Office, 200 12th Street South, Crystal Gateway #4, Suite 1103, Arlington, VA, 22202</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>15</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

## In This Issue:

Joint Live Fire/Aircraft Systems Program (JLF/AS) . . . . .	1
Survivability Course Moves To AFIT . . . . .	3
SURVIAC Product Availability . . . . .	8
SURVIAC Model Availability . . . . .	9
Survivability Textbook Now Available . . . . .	10
JMUM 2003 . . . . .	11
MANPADS Week . . . . .	12
SURVIAC Liaison Workshop To Be Held . . . . .	12
SURVIAC E-News: Are You Missing Out? . . . . .	13
JASPO Short Course . . . . .	13
Farewell To Geri Bowling . . . . .	14
In Memory of Dr. Al Rainis . . . . .	14
Calendar of Events . . . . .	15
Information Request . . . . .	16



### SURVIAC Bulletin Vol XIX Issue 2

SURVIAC, a DoD Information Analysis Center (IAC), is administratively managed by the Defense Information Systems Agency (DISA), Defense Technical Information Center (DTIC), under the DoD IAC Program. SURVIAC is sponsored by the Joint Aircraft Survivability Program Office (JASPO) and for Munitions Effectiveness (JTCG/ME). SURVIAC is operated by Booz Allen Hamilton Inc.

The Contracting Officers Representative (COR) for the Center is Mr. Martin L. Lentz, 46 OG/OGM/OL-AC, 2700 D Street, Bldg. 1661, Wright-Patterson AFB, Ohio 45433-7605. He may be reached at DSN 785-6302 x241 or (937) 255-6302 x241.

Inquiries about SURVIAC's capabilities, products and services, or comments regarding this publication may be addressed to:

46 OG/OGM/OL-AC/SURVIAC  
2700 D St., Building 1661

Wright-Patterson AFB, Ohio 45433-7605

Com: (937) 255-4840, DSN: 785-4840

Fax: (937) 255-9673

E-mail: [surviac@bah.com](mailto:surviac@bah.com) URL: <http://iac.dtic.mil/surviac>

## SURVIAC

### Points of Contact

Com: (937) 255-4840

DSN: 785-4840

Fax: (937) 255-9673

#### Kevin Crosthwaite

SURVIAC Director (ext. 279)

E-mail: [crosthwaite\\_kevin@bah.com](mailto:crosthwaite_kevin@bah.com)

#### Donna Egner

SURVIAC Deputy Director (ext. 282)

E-mail: [degner@bah.com](mailto:degner@bah.com)

#### Gerald Bennett

Survivability Analyst (ext. 281)

E-mail: [gbennett@bah.com](mailto:gbennett@bah.com)

#### Barry Vincent

Model Manager (ext. 273)

E-mail: [vincent\\_barry@bah.com](mailto:vincent_barry@bah.com)

#### Mike Bennett

Model Manager

Com: (937) 431-2707

E-mail: [bennett\\_michael@bah.com](mailto:bennett_michael@bah.com)

#### Paul Jeng

Model Manager (ext. 273)

E-mail: [surviacmodels@bah.com](mailto:surviacmodels@bah.com)

#### Jim Davis

Researcher (ext. 278)

E-mail: [davis\\_james@bah.com](mailto:davis_james@bah.com)

#### Dave Mullins

Technical Support (ext. 207)

E-mail: [mullins\\_david@bah.com](mailto:mullins_david@bah.com)

#### A.J. Brown

Security Specialist (ext. 211)

E-mail: [brown\\_alvin@bah.com](mailto:brown_alvin@bah.com)

#### Leslie Shipp

Research Assistant (ext. 274)

E-mail: [shipp\\_leslie@bah.com](mailto:shipp_leslie@bah.com)

#### Linda Ryan

SURVIAC Bulletin (ext. 208)

E-mail: [liryan@bah.com](mailto:liryan@bah.com)

### Visit our web site !

<http://iac.dtic.mil/surviac>

# Survivability Course Moves to AFIT



**Matt Kolleck**

was reassigned within the Navy, there was a realignment of educational responsibilities within the military services. In this process the Air Force Institute of Technology (AFIT) picked up responsibility for teaching survivability.

The first AFIT survivability course was taught this summer by SURVIAC's Matt Kolleck. Matt taught 18 students, four hours per week, from June until September. They covered the

The home of the aircraft survivability discipline started and resided at the Naval Postgraduate School (NPS) as Prof. Robert Ball taught and literally wrote the book on survivability (see page 10). When he retired, his place at 5 NPS, for a time, was ably filled by Cmdr. Mark Couch. When he

gamut of survivability issues from vulnerability to susceptibility. The course was proclaimed a success and will be repeated, probably next summer. There is interest in also extending this course via VTC to remote sites. The logistics and details are being worked out now. For further information contact Mr. Matt Kolleck, SURVIAC, (937) 781-2832, e-mail: kolleck\_matt@bah.com. ■



**Air Force Institute of Technology (AFIT)**

## The Fundamentals of Aircraft Combat Survivability: Analysis and Design, Second Edition

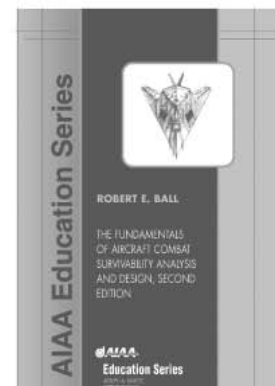
Robert E. Ball, Naval Postgraduate School

**T**he extensively illustrated second edition of this best-selling textbook presents the fundamentals of the aircraft combat survivability design discipline as defined by the DoD military standards and acquisition processes. It provides the history of, the concepts for, the assessment methodology, and the design technology for combat survivability analysis and design of fixed- and rotary-wing aircraft, UAVs, and missiles. Each chapter specifies learning objectives; stresses important points; and includes notes, references, bibliography, and questions.

*The Fundamentals of Aircraft Combat Survivability: Analysis and Design on CD-ROM* is included with your purchase of the book. The CD-ROM gives you the portability and searchability that you need in your busy environment. A solutions manual is also available.

*"The only book on the aircraft survivability discipline that speaks to both the operator and the engineer. THE bible of aircraft survivability!"*

— Maj. Robert "Wanna" Mann  
Chief, B-2 Branch  
Wright-Patterson AFB



**Contents:** ▼ An Introduction to the Aircraft Combat Survivability Discipline

▼ Aircraft Anatomy  
▼ The Missions, the Threats and the Threat Effects

▼ Susceptibility (Ph and Pf)  
▼ Vulnerability (Pk/h and Pk/f)  
▼ Survivability (Ps and Pk)  
▼ Appendices



American Institute of Aeronautics and Astronautics  
Publications Customer Service, P.O. Box 960, Herndon, VA 20172-0960  
Fax: 703/661-1501 • Phone: 800/682-2422; 703/661-1595 • E-mail: warehouse@aiaa.org  
Order 24 hours a day at: [www.aiaa.org](http://www.aiaa.org)

AIAA Education Series  
2003 • 950 pp • Mixed media • 1-56347-582-0  
List Price: \$99.95 • AIAA Member Price: \$69.95

*JLF/AS Continued from page 1*



## AH-1 Testing

As we have seen in recent armed conflict, our front-line helicopter systems are susceptible and vulnerable to attack from readily available threats. One of the threats of primary interest to the vulnerability test and evaluation community is the rocket propelled grenade (RPG). The JLF/AS FY04 Program will investigate the vulnerability of the AH-1 Cobra front-line attack helicopter to this threat. The goal of this effort is to identify potential survivability enhancements for this and other helicopter platforms.

In FY04, JLF/AS will enter the second year of a tri-service (Army, Navy, and Air Force), multi-year investigation of the vulnerability of helicopters (represented by the AH-1) to RPGs. This effort represents the first empirical vulnerability investigation of helicopters to this threat. It will also provide information to aid combat mission planning, aid battle damage assessment repair training, provide vulnerability reduction recommendations and increase aircraft/aircrew survival and effectiveness in combat. Army test planning was completed in FY03 at the facilities of the Survivability/Lethality Analysis Directorate (SLAD) of the Army Research Laboratory (ARL) - Aberdeen Proving Ground, Maryland. Testing is scheduled to begin in 1Q FY04. The Army tests, employing plate arrays and actual helicopter structures as targets, will examine "first-contact" impact parameters including fuze sensitivity, structure penetration, and combined damage mechanisms. Navy tests are scheduled to begin in FY03 at the facilities of the Weapons Survivability Laboratory of the Naval Air Warfare Center Weapons Division (NAWCWD) - China Lake, California. These tests will investigate the self-destruct "air-burst" RPG against an arena of plates followed

by tests against an AH-1S to gather data and compare damage mechanisms (e.g., damage created by "air-burst" encounter compared to damage created by "first-contact" encounter). The RPG project will culminate in FY04 at the 46th Test Wing facilities - Eglin AFB, Florida with tests events against a full-up, operational, instrumented AH-1 helicopter. Quick-look reports will be prepared upon completion of testing by each Service. A single, final report will be prepared in FY05 that will include combined analysis of RPG lethality and AH-1 vulnerability to "first-contact" and "air-burst" fuzing. The ARL project engineer for this effort is Mr. Robert Kunkel, the NAWCWD project engineer is Mr. Hau Nguyen and the 46 OG/OGM/OL-AC project engineer is Mr. Pat O'Connell.



## CH-47 Testing

In FY04, ARL will complete a JLF/AS effort in partnership with the Cargo Helicopter Program Manager (PM), DoD and commercial armor developers to design, manufacture and qualify a shield that will reduce the probability of fuel fires resulting from small caliber projectile impacts on the engine fuel feed shutoff valve located in the CH-47D Chinook helicopter. Testing will be conducted at the ARL/SLAD facilities - Aberdeen Proving Ground, Maryland. This effort will provide information to aid combat mission planning, increase aircraft/aircrew survival and effectiveness in combat, aid battle damage assessment repair training and provide recommendations for more survivable helicopter fuel feed shutoff valves. The overall results are applicable to two fielded Army H-47 models (i.e., D and E; the latter is a special operations aircraft that has seen extensive combat use in Afghanistan and Iraq) and the future production F model. ARL will deliver

er a proven shielding design to protect rotorcraft fuel components, a detailed test plan, a pre-shot prediction report, and a detailed test report. The ARL project engineer for this effort is Mr. Steve Polyak.



### CH-53 Testing

In FY04, JLF/AS will enter the second year of a multi-year investigation into the vulnerability of the CH-53E platform. Threat munitions to be used during this effort include small arms/automatic weapons and anti-aircraft artillery. Ballistic testing will be conducted at the NAWCWD facilities - China Lake, California. This effort will provide information to aid combat mission planning, increase aircraft/aircrew survival and effectiveness in combat, aid battle damage assessment repair training and provide vulnerability reduction recommendations. The first year of this effort (FY03) concentrated on test planning and asset acquisition. In FY04, ballistic tests will be conducted against CH-53E rotor and drive subsystems (main and tail rotor blades, pylon fold, tail drive shaft) under representative dynamic loads. These tests will be used to gather damage data and perform post-damage operating endurance testing on dynamic components to evaluate the reduction or loss of dynamic flight load capability. In FY05, ballistic tests will be conducted against CH-53E fuel systems and dry bays. These tests will be used to assess the vulnerability of the CH-53E to ballistic threat-induced structural removal/damage as a result of ullage explosion and/or dry bay fire. A final report containing results from the entire project will be prepared in FY05. Information collected from this effort will be used to verify/validate the 1979 CH-53E vulnerability assessment.

The Navy project engineers for this effort are Messrs. John Gallagher (NAWCAD) and Joe Manchor (NAWCWD).



### H-60 Testing

In FY04, three H-60 efforts are funded under JLF/AS: dry bay foam vulnerability reduction alternatives, improved durability gearbox (IDGB) run-dry ballistic vulnerability tests and H-60 engine nacelle fire extinguishing system effectiveness against ballistic threats.

Recent ballistic testing with the UH/MH-60 main fuel subsystems identified issues with the reticulated foam installed in the dry bay areas surrounding the main fuel cells. ARL will investigate replacement materials for the current UH/MH-60 fuel cell dry bay foam under the JLF/AS Program in FY04 and FY05. Test planning will occur in FY04 and the ballistic test series will be conducted in FY05 at ARL/SLAD's Experimental Facility 6 (EF6) located at Aberdeen Proving Ground, Maryland. This effort will provide information to aid combat mission planning, increase aircraft/aircrew survival and effectiveness in combat, aid battle damage assessment repair training, and provide vulnerability reduction recommendations. The results of this project will be applicable to all tri-service H-60 fleet of aircraft and the future production of the Army's UH-60M model. ARL will deliver a detailed test plan, a pre-shot prediction report, and a detailed test report. The ARL project engineer for this effort is Mr. Fred Marsh.

*JLF/AS Continued on page 6*

In FY04, ARL will investigate the "run-dry" tolerance of the improved durability gearbox (transmission), currently fielded in several versions of the H-60 helicopter. Test planning will occur in FY04 and the ballistic test series will be conducted in FY05 at ARL/SLAD's EF6 located at Aberdeen Proving Ground, Maryland. The results of this project will be applicable to all tri-service H-60 fleet of aircraft and the future production the Army's UH-60M model. ARL will deliver a detailed test plan, a pre-shot prediction report, and a detailed test report. The ARL project engineer for this effort is also Mr. Fred Marsh.

A tri-service Army, Navy and Air Force effort was initiated in FY02 to conduct parametric controlled damage and ballistic tests to evaluate the influence of varied damage levels to the effectiveness of the current H-60 aircraft engine nacelle fire suppression system with current and alternative fire suppression agents. The main issues are:

- 1) Halon 1301 engine nacelle fire suppression systems are not designed to account for the changing conditions that are incurred as a result of combat damage. Ballistic damage may alter the conditions within an engine nacelle so as to hinder the protection afforded by these systems, and;
- 2) Halon 1301 environmental issues have resulted in some aircraft programs transitioning to alternative fire suppression agents and systems. The effectiveness and limitations of these new systems in suppressing ballistically induced fires is unknown.

In FY02, the Aerospace Survivability and Safety Flight (46 OG/OGM/OL-AC - WPAFB) conducted parametric controlled-damage testing of a simulated H-60 Halon 1301 engine nacelle suppression system. The Aircraft Engine Nacelle (AEN) simulator was modified to representative H-60 dimensions and environmental conditions. These tests are being used to determine damage effects and suppression agent design concentrations within the nacelle, determine possible vulnerabilities as input for follow-on NAWCAD engine nacelle tests and to provide leveraging opportunities for Halon alternative agent tests.



In FY03, NAWCAD conducted controlled-damage and ballistic tests on the H-60 Halon 1301 engine nacelle suppression system. An H-60 engine nacelle with non-running engine and component clutter under representative environmental (airflow) conditions was used. These data provide input for follow-on (FY04) NAWCWD running engine/systems tests and provide leveraging opportunities for Halon alternative agent tests. In FY04, NAWCWD will conduct ballistic demonstration/ data validation tests on an H-60 engine nacelle suppression system. An engine nacelle with operating engine and related nacelle systems under representative environmental (airflow) conditions will be used. These tests will help to identify locations vulnerable to ballistically induced fires and will also provide leveraging opportunities for Halon alternative agent tests. The Air Force project engineer for this effort is Mr. Pat O'Connell (46 OG/OGM/OL-AC), the Army project engineer is Mr. Fred Marsh (ARL) and the Navy project engineers are Mr. Joe Dolinar (NAWCAD) and Mr. Joe Manchor (NAWCWD).



## Predator Testing

Up to now, unmanned aerial vehicles (UAV) have been designed strictly for mission effectiveness - vulnerability reduction was not a consideration as most UAVs were con-

sidered expendable. However, UAVs continue to grow in numbers and cost, and as their mission value grows, they will no longer be considered expendable. There is a growing interest in implementing enhancements in UAV designs to provide the mission commander with a more survivable aircraft. In FY04, the JLF/AS Program will conduct system vulnerability testing of a Predator fuselage and subsystems (fuel, propulsion, and control) mock-up before and after select vulnerability reduction features are in place. In keeping with the DDOT&E/LFT's desire to more closely integrate the JLF program to other DOT&E investment programs, shotlines for this effort will be based on the COVART analysis previously completed under the JASPO Predator Vulnerability Analysis (FY03). This analysis identified vulnerable areas in the current Predator design that can be addressed in future builds. This project directly supports the UAV Program Office (ASC/RAB - WPAFB) in identifying vulnerability reduction improvements that can be made to present, or future blocks of the aircraft. These lessons learned can be applied to other UAVs/UCAVs as well. The Navy project engineer is Mr. Jim Young (NAVAIR) and the Air Force project engineer is Mr. Pat O'Connell (46 OG/OGM/OL-AC).

### Large Turbofan Engine Testing

In FY04, JLF/AS will initiate a multi-year effort to investigate the vulnerability of the CF6 large turbofan engine to MANPADS. The following long-standing issues will be addressed: 1) What is the inherent vulnerability of an operational CF6 engine hit by a MANPADS? 2) How does the hit-point and damage-state compare to pretest predictions? 3) How does the damage affect engine operation and thrust? 4) How will the thrust alteration affect safety-of-flight? and, 5) If damage produces a kill, what is the kill mechanism? Test planning will occur in FY04. In FY05, MANPADS tests will be conducted on non-flight worthy CF6 assets in order to conduct a quick-look assessment of engine vulnerability, which will be correlated with LS Dyna 3D damage predictions (a JASPO FY04 new-start). Damage affects on engine thrust and safety-of-flight (GE & NASA roles) will be assessed. In FY06, a MANPADS test will be conducted on a flight worthy, wing-mounted CF6 engine to obtain full-up assessment of engine vulnerability. Test results will be compared to pretest pre-

dictions involving hit-point and damage state. Engine thrust and safety-of-flight issues resulting from the damage will be assessed. A detailed test plan, pretest predictions and a JLF/AS final report describing large-engine vulnerability to MANPADS and potential effects of safety-of-flight issues will be delivered. Test results from this effort will support large aircraft (i.e., C-17, KC-767 and E-10A) operational risk assessments and vulnerability analyses leading to improved warfighter protection. Results of large engine characteristics to MANPADS impact and detonation identified during this effort will be used to feed future large engine design and evaluation requirements. Messrs. Greg Czarnecki and Nathan Cook (46 OG/OGM/OL-AC) are the Air Force project engineers for this effort. ■

## **DSCC to DISA**

For years the contractual responsibility for the SURVIAC contract was ably handled by the Defense Supply Center, Columbus (DSCC). They processed contract mods, delivery orders and MIPRs for new SURVIAC tasks. Over the summer this responsibility shifted to the Defense Information Systems Agency, DISA. They have shouldered the heavy workload of all IAC contractual actions. They particularly shined in the intense end of the year activity as SURVIAC tasking has jumped up considerably in the homeland security part of our new charter. In the future all MIPRs and contract actions will go through Mr. Frank Wheeler, SURVIAC Contracting Officer at DISA. To aid in the transition, MIPRs are now to be sent to:

Defense Technical Information Center  
Attn: DTIC-AI-MIPR/IAA  
8725 John J. Kingman Rd., Ste. 0944  
Ft. Belvoir, VA 22060-6218



# SURVIAC Product Availability

SURVIAC is a U.S. Department of Defense Information Analysis Center (IAC) sponsored by the Defense Technical Information Center (DTIC)

Product	Classification	Reproduction & Handling Fee
A Critical Review of Graphite Epoxy Laser Damage Studies	SECRET	\$ 50.00
A Summary of Aerospace Vehicle Computerized Geometric Descriptions of Vulnerability Analyses	Unclassified	\$100.00 (Free to Gov't)
Advanced Materials for Enhanced Survivability	SECRET	\$100.00
Aircraft Fuel System Fire and Explosion Suppression Design Guide	Unclassified	\$150.00/3 Volumes
'Aircraft Survivability' Video	Unclassified	\$ 50.00 or 30-Day Loan
Alternatives For Halon 1301 In Army Ground Vehicle Firefighting Systems	Unclassified	\$250.00
An Overview of Laser-Induced Eye Effects	SECRET	\$150.00
An Overview of Laser Technology and Applications	Unclassified	\$ 50.00
'Battle Damage Repair of Composite Structures' Video	Unclassified	\$ 75.00
Collection of Vulnerability Test Results for Typical Aircraft Systems and Components	CONFIDENTIAL	\$150.00
Comparative Close Air Support Vulnerability Assessment Study - Executive Summary	SECRET	None (Gov't. Only)
Compendium of References for Nonnuclear Aircraft Survivability (A Supplement to MIL-HDBK-336)	Unclassified	\$150.00
Component Vulnerability Analysis Archive (CVAA) and Workshop Notes	Unclassified	\$300.00 (Free to Gov't)
Component Vulnerability (Pd/h) Workshop Component Pd/h Handbook w/addendum	SECRET	\$200.00 (Free to Gov't)
Component Vulnerability Database Development - CD	SECRET	\$100.00 (Free to Gov't)
Countermeasures Handbook for Aircraft Survivability (3 Volumes)	SECRET	\$200.00 (Free to Gov't)
Critical Review and Technology Assessment (CRTA) for Soldier Survivability (SSv)	Unclassified	\$ 50.00
'Designing for Survivability' Video	Unclassified	30-Day Loan
Directed Energy Effectiveness Modeling State-of-the-Art Report (SOAR)	Unclassified	\$ 50.00
Gas Explosion Suppression Agent Investigation	Unclassified	\$200.00
Gun and Missile Pedigree Threat Reports - CD	SECRET	\$150.00
Joint Live Fire/Live Fire Test Program Catalogue, Version 3.1	Unclassified	\$ 95.00
MANPADS Threat to Aircraft: A Vulnerability Perspective - Final Report	SECRET	\$200.00
Model User Group Meeting Minutes - CD	Unclassified	\$ 50.00
Munition Response State-of-the-Art Report (SOAR)	Unclassified	\$ 50.00
National MANPADS Workshop: A Vulnerability Perspective Proceedings - 2 Volumes	SECRET	\$200.00
Penetration Characteristics of Advanced Engine Materials	Unclassified	\$100.00
Proceedings of the Eighth DOD Conference on DEW Vulnerability, Survivability and Effects - 2 Volumes	SECRET	\$125.00/Per Set
RADGUNS 1.8 Parametric Study	SECRET	\$100.00 (Free to Gov't)
Ship Survivability Overview	Unclassified	\$ 50.00
'SURVIAC - A Capabilities Overview' Video	Unclassified	30-Day Loan
Survivability Analysis Workshop Notebook - 2000	Unclassified	\$100.00 (Free to Gov't)
Survivability Systems Master Plan	Unclassified	\$ 50.00 (Free to Gov't)
Testing of Aircraft or Aircraft Surrogates with On-Board Munitions	Unclassified	\$100.00
"Threat Effects in Aircraft Combat Survivability" Video Loan	Unclassified	\$150.00 or 60-Day
Threat Warheads and Effects/Battle Damage Assessment and Repair Archival and Retrieval (TWE/BDAR) System	Unclassified	\$300.00
Ullage Explosion Hazard State-of-the-Art Report (SOAR)	Unclassified	\$200.00
Unmanned Aerial Vehicles Survivability Compendium—Interim Report Database	Unclassified	\$200.00
U.S. Air Force Surface-To-Air Engagements During Operation Desert Storm	SECRET	\$100.00 (Free to Gov't)
Vulnerability Reduction Design Guide for Ground Systems in a Conventional Combat Environment	Unclassified	\$200.00



For further information on how to obtain these products and how to establish need-to-know certification, please contact SURVIAC at (937) 255-4840 or DSN 785-4840. Requests for non-U.S. agencies must be forwarded to their country's Embassy in Washington DC, Attn: Air Attache's Office.

# SURVIAC Model Availability

SURVIAC is a U.S. Department of Defense Information Analysis Center (IAC) sponsored by the Defense Technical Information Center (DTIC)

Model	Classification	Reproduction & Handling Fee
AIRADE 7.4—Airborne Radar Detection Model	SECRET	\$500.00
ALARM 4.5—Advanced Low Altitude Radar Model (Includes EARCE 2.5)	Unclassified	\$500.00
BLUEMAX IV—Variable Airspeed Flight Path Generator	Unclassified	\$500.00
BRAWLER 6.5—Air-To-Air Combat Simulation	SECRET	\$500.00
*BRL-CAD 6—Ballistic Research Laboratory Computer-Aided Design Package	Unclassified	\$500.00
***COVART 4.3—Computation of Vulnerable Area and Repair Time	Unclassified	\$500.00
DIME 2.1—Digital Integrated Modeling Environment	Unclassified	\$500.00
ESAMS 3.0—Enhanced Surface-To-Air Missile Simulation	SECRET	\$500.00
***FASTGEN 4.7—Fast Shotline Generator	Unclassified	\$500.00
FATEPEN—Fast Air Target Encounter Penetration Program	Unclassified	\$500.00
IVIEW 2000—Graphical User Interface for Output Simulation	Unclassified	\$100.00
JSEM - Joint Service Endgame Model	Unclassified	\$500.00
LELAWS 3.0—Low Energy Laser Weapons Simulation	Unclassified	\$500.00
MIL-AASPEM 5.3 — Man-in-the-Loop Air-To-Air System Performance Evaluation Model	Unclassified	\$500.00
RADGUNS 2.3—Radar-Directed Gun System Simulation	SECRET	\$500.00
TRAP 3.1a—Trajectory Analysis Program	Unclassified	\$500.00
TRACES 1.0—Terrain/Rotorcraft Air Combat Evaluation Simulation	Unclassified	\$500.00

\* For more information regarding BRL-CAD documentation contact Mr. Dwayne Kregel at the SURVIAC Aberdeen Satellite, Office, (410) 273-7722.

\*\* For more information regarding JSEM documentation contact Mr. John Manion at the SURVIAC Aberdeen Satellite, Office, (410) 273-7722.

\*\*\* Model is now part of the Vulnerability Tool Kit



For further information on how to obtain these models and how to establish need-to-know certification, please contact SURVIAC at (937) 255-4840 or DSN 785-4840. Requests from non-U.S. agencies must be forwarded to their country's Embassy in Washington DC, Attn: Air Attache's Office.

## Survivability Textbook Second Edition Now Available

In 1985, the American Institute of Aeronautics and Astronautics (AIAA) published *"The Fundamentals of Aircraft Combat Survivability Analysis and Design"* as the fourth book in their new Educational Series. The world's first textbook on aircraft survivability was authored by Professor Robert E. Ball, Department of Aeronautics and Astronautics, Naval Postgraduate School, and funded by the Joint Aircraft Survivability Program Office, JASPO, (formerly the Joint Technical Coordinating Group on Aircraft Survivability, JTTCG/AS). The 400 page textbook became an overnight sensation. In the past 18 years, approximately 10,000 copies were sold, and the book was a perennial 'best seller.'



**Prof. Robert E. Ball**

JASPO, is now pleased to announce the publication by the AIAA of the second edition of Professor. Ball's textbook. From the Preface of the second edition—"This second edition is more than just an expansion of the 1985 textbook. It is now, truly, a student's textbook. It should also be more useful to the person who wants to learn what the discipline is all about. It has been rewritten into a form that should be useful to those who want to know only the essentials of the discipline (read Chapter 1), as well as to those who want to know all of the details (read the rest of the textbook). Large amounts of new material have been added throughout the textbook, and a new appendix on probability theory and its application to survivability assessment has been introduced. Learning objectives have been added at the beginning of each major section, and problems are now at the end of each section for those who are serious about learning the material. This second edition also provides the author with an opportunity to present information on the survivability features of several current U.S. military aircraft and some of the combat data from the SEA Southeast Asia conflict and Operation Desert Storm.

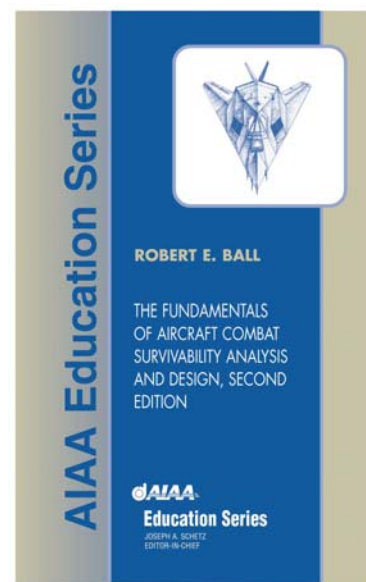
This information has only recently been released to the public."

The major sections of the over 900 page second edition include the Preface, Prologue, Acknowledgement, Acronyms, Chapter 1—*An Introduction to the Aircraft Combat*

*Survivability Discipline*, Chapter 2—*Aircraft Anatomy*, Chapter 3—*Missions, Threats, and Threat Effects*, Chapter 4 *Susceptibility (PH and PF)*, Chapter 5— *Vulnerability (PK/H and PK/F)*, Chapter 6— *Survivability (PS and PK)*, Appendix A - *Survivability Features of Several Aircraft Used in World War II*, and Appendix B— *Probability Theory and Its Application to Survivability Assessment*. A separate Solutions Manual for the problems in the textbook is also available.

A hard copy, accompanied by a complete, searchable CD-ROM, can be purchased from the AIAA directly (<http://www.aiaa.org/store/storeproductdetail.cfm?id=1008>) at a cost of \$99.95, or \$69.95 for AIAA members, or from any bookstore or online book seller, such as Amazon.com.

Government employees, both civilian and military, who have a need to know the information presented in the book may be able to obtain a copy at no cost from the JASPO by calling Ms. Linda Ryan, SURVIAC at (937) 255-4840 x208 or by email at [liryan@bah.com](mailto:liryan@bah.com). ■



## JMUM 2003

The Joint Aircraft Survivability Program Office (JASPO) Model User Meeting (JMUM) 2003 was held on 17-20 June 2003 at the Naval Postgraduate School in Monterey, California. This was the eighth annual combined users meeting that the Survivability/Vulnerability Information Analysis Center (SURVIAC) has executed and the JASPO has funded. The models included in the JMUM are:

- AJEM - Advanced Joint Effectiveness Model
- ALARM - Advanced Low Altitude Radar Model
- BLUEMAX - Flight Path Generator
- BRAWLER - Air-to-Air Combat Model
- COVART - Computation of Vulnerable Areas and Repair Times
- ESAMS - Enhanced Surface-to-Air Missile Simulation
- FASTGEN - Fast Shotline Generator
- MIL AASPEM - Man-in-the-Loop Air-to-Air System Performance Evaluation Model
- RADGUNS - Radar Directed Guns Simulation

100 representatives participated in this year's meeting from various services and DoD contractors.

The layout of JMUM included two days of general session, followed by two days of breakout sessions. The general session started with a JASPO briefing and continued with briefings from the Defense Modeling and Simulation Office, DMSO and SURVIAC. Technical briefs on models status as well as different modeling tools and capabilities were also presented. Updates on the Joint Modeling and Simulation System (JMASS) and National Air Intelligence Center (NAIC) were presented to the community. Other presentations that were presented in the general session included New Accreditation Support Package (ASP) Specification, Air Force Modeling Toolkit, Integrated Survivability Assessment (ISA), and Joint Strike Fighter Strike Warfare Collaborative Environment.

Following the general session, breakout sessions for the models were held. Model specific topics were discussed during each of these sessions. Each breakout session presented in

depth on the status of the model and their future schedules were discussed. The breakout sessions included formal presentations and working forums for the users. The working groups also included Configuration Control Board (CCB) meetings. The users and the CCB members were involved in discussing model deficiencies, which were voted on for incorporation into the model by the CCB members. Having the users present during the CCB discussions has proven to be invaluable. The user can provide information that would otherwise not be available for discussion.

JMUM is an excellent networking event for the SURVIAC models users. This is an informative meeting for everyone who is interested in the JMUM model suite. The meeting promotes openly discussing hardware and software issues related to each of the JMUM models.

The minutes of the meeting and all unclassified presentations were distributed on CD to all attendees. This CD is also available to non-attendees from SURVIAC for \$50. ■



*For more information on JMUM or to obtain a copy of the meeting CD, please contact Mr. Paul Jeng, SURVIAC, (937) 255-3828 x273 E-mail: [surviacmodels@bah.com](mailto:surviacmodels@bah.com)*

## MANPADS Week

The threat of Stinger missiles to US military and civilian aircraft and other systems is great, and there is a need for testing our systems against Stingers. Therefore, the Chicken Little Joint Munitions Test and Evaluation Program Office at Eglin AFB and the SHORAD Project Office are offering to provide Basic Stinger Missiles and range time to support this testing need. We are calling this effort "MANPADS Week", and plan on hosting it during the spring of FY05.

The types of testing to be accomplished with the Stingers will be driven by the participating organizations requirements. We envision testing to include Live Fire testing against fielded systems and systems under development, countermeasures testing, and tests to gather signature measurements. Organizations interested in participating in MANPADS Week would need to bring their systems to the test site



for testing. Participating organizations would also need to fund any unique costs (i.e. instrumentation, transportation, or special equipment) associated with testing their systems above basic range support and the Stingers.

If you are interested in participating in this event or have questions, please contact Brian Plunkett at (850) 882-9389 or via email at [brian.plunkett@eglin.af.mil](mailto:brian.plunkett@eglin.af.mil).

## SURVIAC To Hold Liaison Workshop

The Survivability/Vulnerability Information Analysis Center (SURVIAC) cordially invites you to join our annual SURVIAC Liaison Workshop at our facility at Wright Patterson AFB, Ohio on 30 March - 1 April 2004.

SURVIAC implemented this innovative liaison program to expand the survivability/vulnerability user base through the on site training of Government and Industry volunteers located remotely from the Wright Patterson AFB Ohio office. The purpose of the Liaison training program is two-fold. The objective is to increase the knowledge about SURVIAC and what resources we have to support other agency's/company's mission. The second objective is to inform us about your respective needs so that we can better support you in the future. The workshop is open to government and industry personnel.

Three days will be spent investigating databases and libraries, performing searches, reviewing products and models, reviewing Technical Area Tasks, becoming familiar with key survivability and lethality agencies, as well as simply becoming familiar with the day-to-day operation of the SURVIAC office.

Discussions will be held relative to ongoing efforts in the survivability/lethality communities and a briefing will be presented by the Defense Technical Information Center (DTIC) Information Analysis Center (IAC) Program Office. Each participant will be informed on how the IACs and DTIC interrelate and how they are available to support the varied warfighter missions. The last day will be spent discussing the needs of each liaison and how a more effective relationship through this program might be established. In addition to the instruction, participants will receive products and models of their choice, a \$2000.00 value. Attendees will come away with the realization that a vast amount of information is available both at SURVIAC and throughout the community.

*If you would be interested in becoming your organization's*

*SURVIAC liaison, please contact:*

*Ms. Donna Egner*

*(937) 255-3828 x282, DSN 785-4840*

*E-mail: [degner@bah.com](mailto:degner@bah.com)*

# SURVIAC E-News: Are You Missing Out?

In October SURVIAC began distributing its new electronic newsletter, SURVIAC E-News. This newsletter presents links to articles of interest to members of the survivability/vulnerability community.

In this weekly electronic newsletter you will find links to many topics of interest to our SURVIAC subscribers including survivability, lethality, modeling and simulation, homeland security and space survivability. There are also links to the SURVIAC Bulletin and the Aircraft Survivability Journal. A one-stop survivability news source!

Did you miss out? The SURVIAC E-News was distributed to those who are already subscribed to the SURVIAC Bulletin. If you did not receive your copy we may not have your correct email address on file. Don't miss out again! To subscribe, unsubscribe, or to just give us comments and suggestions on E-News, email us at [surviacenews@bah.com](mailto:surviacenews@bah.com).

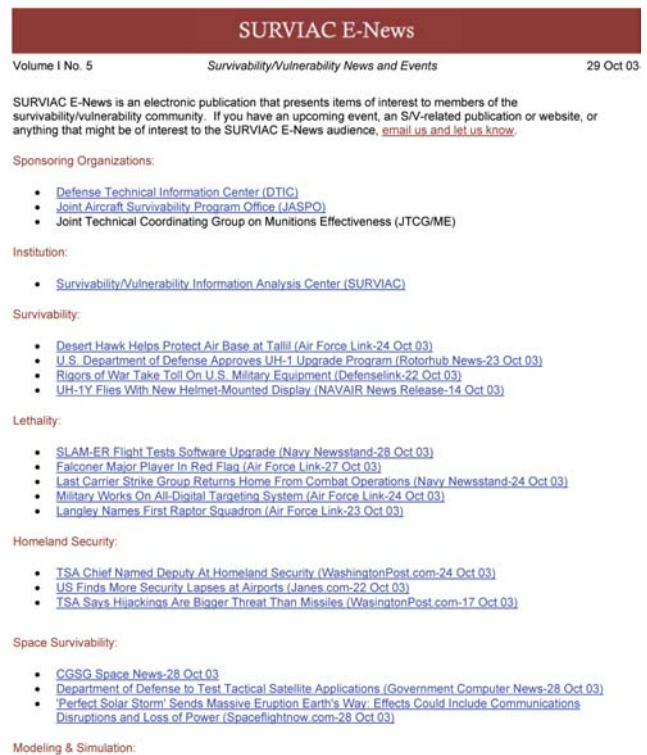
## JASPO Short Course

On 18-20 November 2003 the Joint Aircraft Survivability Program Office (JASPO) sponsored an Aircraft Survivability Short Course in Williamsburg, Virginia. The course was intended as a regional flavor and arose out of discussion between JASPO and Aviation Applied Technology Directorate (AATD) at Ft. Eustis, Virginia. The course was structured as an unclassified forum on the survivability discipline and highlighted some current ongoing projects. There were a total of 21 presentations by 13 different speakers. SURVIAC had a key role in presenting general information on survivability, but a key part of the course was specific helicopter related information and up-to-date information from the JASPO subgroup chairs. Topics of discussion included: Introduction to Survivability, Mission, Threats and Effects, Historical Combat Data, Survivability Assessment, Susceptibility Overview, Vulnerability Overview, One-on-One Engagement Overview, Mission & Campaign Analysis, Personnel Casualties, Helicopter - Specific Aspects of Vulnerability, Helicopter - Specific Aspects of Susceptibility,

Crashworthiness & Safety, Key Agencies, Survivability Assessment Technology focus areas, JASA, Vulnerability Reduction Technology focus areas, Susceptibility Reduction Technology focus areas, SURVIAC, Live Fire Test (LFT) and JLF-Air, and JCAT (includes ABDR)

The course was well received by the 53 attendees. The intention is to offer updated versions of this course annually. Each course would be tailored to the primary interest of the prospective attendees in that region of the country.

*For more information about this course  
or to express interest in hosting a course  
in your region of the country, contact  
Mr. Joe Jolley, JASPO, (703) 607-3509 x12*



## **SURVIAC Says Farewell to Longtime Employee**



On June 2, 2003 SURVIAC said farewell to long-time employee Geri Bowling who retired after 17 years of service.

Geri started with Booz Allen Hamilton at the SURVIAC office in 1986 as a secretary. She worked building and maintaining the SURVIAC

library. Later she became Model Administrator, supporting user meetings and shipping models to users around the country. She has supported countless new model versions, stood several security inspections and survived two traumatic office moves of all SURVIAC resources - classified and unclassified. While Geri will no longer be a current part of our SURVIAC family, she is looking forward to spending more time with her husband and family and attending many soccer games. We all wish her the best.

### **Test & Evaluation Conference & Exhibition**

**1-4 March 2004  
The Nugget Hotel, Sparks, Nevada**

It has been 20 years since the US Congress put into law the requirement that an independent Operational Test and Evaluation Office be established within the Office of the Secretary of Defense for the purpose of assuring that realistic operational T&E is conducted and promptly & candidly reported to Congress prior to a system entering Full Rate Production.

It's time to examine this very important and very visible part of the Defense Systems Acquisition establishment, the largest government procurer of products in the world, to examine how successful it has been, what its benefits and liabilities have been, and some other issues.

**For more information contact:**  
**NDIA, Dania Kahn**  
**(703) 247-2587**  
**E-mail: [dkhan@ndia.org](mailto:dkhan@ndia.org)**  
**Web: [www.ndia.org](http://www.ndia.org)**

### **Strategic and Tactical Missile Systems Conference**

**3 - 5 Feb 2004  
Monterey, California**

This conference offers a careful balance between policy and programs, as speakers explore budget challenges, emerging requirements, threats, industry base, opportunities, concerns, and significant issues ahead. A question-and-answer period will follow each presentation to permit audience interaction with our national security leadership and with those charged with the responsibility of keeping it strong.

**For more information contact:**  
**AIAA**  
**(800) 639-2422**  
**E-mail: [custserv@aiaa.org](mailto:custserv@aiaa.org)**  
**Web: [www.aiaa.org](http://www.aiaa.org)**

## **In Memory of Dr. Al Rainis**

by Kevin Crosthwaite

On 5 May 2003 the survivability community lost a good friend. Dr. Al Rainis passed away in his hometown of Mt. Pleasant, South Carolina. Dr. Rainis retired from the U.S. Government where he had a distinguished civilian career as a scientist and senior staff member of the Office of the Secretary of Defense.

Dr. Rainis was always a strong and articulate supporter of SURVIAC. He was a wise and effective advisor for me as the SURVIAC Director. In 1997 Dr. Rainis was the first person to whom I took a briefing on the emerging impact of MANPADS based on analysis of SURVIAC combat data. While with a glint in his eye he accused me of being another money grabbing contractor, he did immediately take action. The early JTCG/AS MANPADS studies, workshops and eventually the JASMAN program all derived from his initiative.

At the time of his death, he was an adjunct professor in the Department of Physics and Astronomy, College of Charleston and a Consultant to the Office of the Secretary of Defense in Washington, DC. He will be greatly missed.

# Calendar of Events

## February 2003

### Tactical Wheeled Vehicles

1-3 February 2004

Monterey, California

POC: NDIA, Angie DeKleine, (703) 247-2599, E-mail: adelkeine@ndia.org, www.ndia.org

### West 2004 "Born Joint"

3-5 February 2004

San Diego, California

POC: AFCEA, (800) 336-4583, www.afcea.org

### Strategic and Tactical Missile Systems Conference

3-5 February 2004

Naval Postgraduate School, Monterey, California

POC: AIAA, (800) 639-2422, E-mail: custserv@aiaa.org, www.aiaa.org

### Space Technology and Applications International Forum-2004 (STAIF-2004)

8-12 February 2004

Albuquerque, New Mexico

POC: AIAA, (800) 639-2422, E-mail: custserv@aiaa.org, www.aiaa.org

### AUVSI Unmanned Systems Program Review

10-12 February 2004

Washington, DC

POC: AUVSI, (703) 902-2720, www.auvsi.org

### UAV/UCAV Payloads

11-12 February 2004

Adelphi, Maryland

POC: AOC, (703) 549-1600 or (888) OLD-CROW, www.crows.org

## March 2003

### Test & Evaluation Conference & Expo

1-4 March 2004

Sparks, Nevada

POC: NDIA, Dania Kahn, (703) 247-2587, E-mail: dkhan@ndia.org, www.ndia.org

### 14th Annual Advanced Technology Electronic Defense Systems (ATEDS): "Enabling the Warfighter Through Effective EW"

9-11 March 2004

San Diego, California

POC: SAIC, Heather Burress, (812) 384-3587 ext. 219, E-mail: heather.ann.burress@saic.com, www.ateds.com

### AAAA Annual Convention

24-27 March 2004

Nashville, Tennessee

POC: AAAA National Office, (203) 268-2450, www.quad-a.org

### SURVIAC Liaison Workshop

30 March - 1 April 2004

Wright-Patterson AFB, Ohio

POC: SURVIAC, Donna Egner, (937) 255-3828 x282, DSN: 785-4840, E-mail: degner@bah.com

## April 2004

### Aircraft Fire and Explosion Course

6-8 April 2004

Woburn, Massachusetts

POC: BlazeTech, Mr. Albert Moussa, (617) 661-0700, E-mail: amoussa@blazetech.com

[http://www.blazetech.com/course\\_listings/course\\_listings.html](http://www.blazetech.com/course_listings/course_listings.html)

**Subscribe  
to the SURVIAC Bulletin  
and  
JASPO's  
Aircraft Survivability  
Journal**



**Contact Linda Ryan  
SURVIAC  
Com: (937) 255-3828 x208  
DSN: 785-4840 x208  
E-mail: [surviac@bah.com](mailto:surviac@bah.com)**

**SURVIAC Distribution/Information Request**

- ☐ Change the Distribution Information as Shown Below
- ☐ Add My Organization to the **SURVIAC Bulletin** Distribution List
  - ☐ Hard Copy    ☐ Electronic Copy by e-mail (.PDF)    ☐ Both
- ☐ Add My Organization to the **SURVIAC E-News** Weekly News Update
- ☐ Add My Organization to the **JASPO Aircraft Survivability Journal**
- ☐ Request SURVIAC Technical Area Task Information (Government)
- ☐ Request SURVIAC Subscription Plan Information Package (Industry)

NAME \_\_\_\_\_

TITLE \_\_\_\_\_

COMPANY/ORG \_\_\_\_\_

DIVISION \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY/STATE/ZIP \_\_\_\_\_

COUNTRY \_\_\_\_\_

DSN \_\_\_\_\_

COM \_\_\_\_\_

FAX \_\_\_\_\_

E-mail \_\_\_\_\_

SERVICE :   ☐ USA   ☐ USAF   ☐ USN   ☐ USMC   ☐ DoD   ☐ Contractor

Return to: Linda Ryan, 46 OG/OGM/OL-AC/SURVIAC

2700 D Street, Building 1661

Wright-Patterson AFB, Ohio 45433-7605

Com: (937) 255-3828 x208, DSN: 785-4840, FAX: (937) 255-9673

E-mail: [surviac@bah.com](mailto:surviac@bah.com)

*The SURVIAC Bulletin is now available in electronic format by e-mail. This allows you to avoid printing delays and receive your newsletter earlier. To sign up for this distribution, please fill out the coupon above.*

For further information on how to obtain products and how to establish need-to-know certification, please contact SURVIAC at (937) 255-4840, FAX (937) 255-9673. Requests from non-U.S. agencies must be forwarded to their country's Embassy in Washington, D.C., Attn: Air Attache's Office.

**SURVIAC**

46 OG/OGM/OL-AC/SURVIAC

2700 D St., Building 1661

Wright-Patterson AFB, OH 45433-7605

PRSR STD  
US POSTAGE PAID  
DAYTON OH  
PERMIT NO 1161